# What's so Confusing: Central Auditory Processing Disorder vs. Dyslexia

**An Honors Thesis (HONR 499)**

**by**

Rebecca Weber

**Thesis Advisor**

Mr. Greg Newman

**Ball State University**
**Muncie Indiana**

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**Abstract:**

Ever since the birth of audiology, around the time of WWII, many advancements and discoveries have been made. After exploring the mechanisms in the auditory system that allow hearing to take place, next came new discoveries of disorders involved in that system. One such disorder, Central Auditory Processing Disorder (CAPD), takes place in the cerebral part of the auditory system. As with most disorders, CAPDs characteristics share qualities with other disorders. Throughout this paper the comparisons and contrasts between CAPD and dyslexia, another disorder in the cerebral cortex, are explored and identified. The main items explored in this paper are what each disorder is, who they affect and to what degree, where the deficit comes from, and in the end how to help and accommodate for them.

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I would like to thank Mr. Greg Newman who advised and encouraged me throughout this project. His support, flexibility, and knowledge on the subject was invaluable, as well as his help throughout my education during college.

I would also like to thank Rosie and Alex for supporting me and encouraging me to actually do the work necessary for this project. As well as, Haley for helping me through the editing process. I'd be lost without them.

Process Analysis Statement:

To write this paper there were a number of different things I had to do to complete it. The topic of this paper originates from some ideas that both my mother, a certified SLP (Speech Language Pathologist), and my advisor suggested. With both of their inputs, I was then able to begin drafting a proposal and getting the permission to go forward with this project. It all began by finding an advisor and ended through having that advisor sign off and finish the thesis.

Once I picked my topic and had the approval of both my advisor and Ball State's Honor College, I then met up with my advisor to schedule our appointments throughout the spring semester. At each appointment, I would have him read through what I had so far and ask for critique and help with any mistakes I may have made, both in the information and in the writing. I tried to meet with him twice monthly and write around five pages for him each time we met. By doing this, I hoped to complete it around the beginning of April and finish the revision in the remaining month.

The actual writing of this paper all began with a simple outline that referenced what I wanted to cover, from what each disorder is to treatments and accommodations. I then used scholarly sources from the internet and a PowerPoint from a course, SPAA 344 (Audiology 2), taught by my advisor to gather information for the thesis. During each portion from the outline, I would gather either a new source or reuse one from an earlier section. Through this method, I was able to acquire a larger sample of what is out, as far as information is concerned. Once I was finished compiling the information, I then had my advisor check it once more.

For editing of this thesis, I had a fellow Honors College student review it for me, to check what I had missed. Once I got the "okay" from her, I then gave my advisor the final copy of my thesis and had him submit a grade and sign the checklist, that way I could submit it to both the

Honors College and the Ball State Library. After having him sign the checklist, I finally submitted the thesis to Ball State's Honor college in both hard copy form and as a pdf.

Thesis:

Around the world people rely on their sense of hearing and ability to read text to understand and communicate with their surrounding community. Without the capability of hearing or reading people often find themselves lost or confused. For example, imagine when you're in a conversation and cannot understand what someone is saying no matter how many times they repeat it, or when you've just woken up and your eyes seem to not understand any text placed in front of them. These are just more normalized examples of two disorders that many people face daily; the two disorders, Central Auditory Processing Disorder (CAPD) and dyslexia, are much more common and distressing than the common person may think.

Most people may ask, "What is CAPD?" and "How do I identify it?" Well, to first be able to identify CAPD there needs to be a working definition of it. The current working definition is from ASHA.org, states that CAPD is when there are deficits to the neural processing of auditory information. It also states that, although it is a disorder dealing with the hearing process, it does not actually involve a hearing loss. Another major point with CAPD is that it can have comorbidities (coexist with other disorders). Although this definition gives people a broad base to start off with, it is also helpful to give different symptoms of CAPD (Central Auditory Processing Disorder, 2019).

When looking at specific signs and symptoms of CAPD, one of the chief sources of information comes from ASHA.org as well. When first testing or examining someone suspected of having CAPD, it is important to note that they may have one or multiple symptoms from the list, however having all the symptoms at once is highly unlikely and could lead to a different disorder or comorbidity. The list from American Speech-Language Hearing Association (ASHA) contains many different groups that can be combined. For instance, people with CAPD have

issues with musical skills, such as learning nursery rhymes or singing skills. These individuals also have issues with attention, as they are easily distracted. These individuals also have difficulty localizing sound. This basically means that they just have problems identifying where a sound is coming from. Another concern for people with CAPD would be the environment they are in. Noisier environments make it more challenging for them to understand spoken language (Central Auditory Processing Disorder, 2019).

Another major symptom of those with CAPD would be difficulties with speech and language. These individuals would have poor performance on speech and language tests that involve auditory-related skills. They would also have reading, spelling, and learning problems. This could affect them at every point in development, as well as make them seem like poor students. Additionally, these individuals have difficulty learning a new language (Central Auditory Processing Disorder, 2019).

People with CAPD would also experience longer pauses during conversation. During this time, they are trying to understand what was said previously. During conversation, people with CAPD would also experience other conversation faux pas, such as inappropriate responses or frequent requests for a repetition of what was said. They would also have complications with rapid speech, and complex/multistep directions. Finally, an individual with CAPD would have difficulties identifying the subtle nuances of language, such as prosody or changes in tone to help identify jokes (Central Auditory Processing Disorder, 2019).

After defining CAPD and giving this disorder its unique characteristics, next it is important to give dyslexia, the other major disorder in this paper, a definitive meaning. Although these two disorders are both sensational modalities, they do differ in key ways.

According to the Mayo Clinic, dyslexia is a learning disorder that deals with the decoding of messages. By “decoding” it means difficulty reading due to the fact that these individuals have problems identifying sounds and then learning how they relate to different letters and words. Overall, this particular disorder deals with how language is processed, much like CAPD is.

One big question, then, is what are the symptoms or signs of dyslexia? The symptoms of dyslexia can be split into three categories: Before school, school age, and teens and adults. These three distinctions give teachers and guardians a steady guide as to what to expect if they suspect their child of having dyslexia. Before going into the signs/symptoms, it is important to note that these indicators will not become apparent until the individual begins to learn to read. With every disorder, severity ranges from person to person, so they may not display all of these signs/symptoms (Dyslexia, 2017).

When looking at individuals who may have dyslexia it is important to understand when different milestones, such as speaking or reading, are reached. Symptoms that may occur before a person enters school could be late talking or not learning words as quickly as other children. This could mean an individual might not be speaking by the first year. They could also experience problems with forming words, such as reversing sounds or different words that sound similar. Another problem that people experience before school would be naming colors, letters, and numbers. Finally, these children could have difficulty learning or playing with rhymes, such as nursery rhymes (Dyslexia, 2017).

School age individuals would exhibit more apparent symptoms/signs of dyslexia. One of the most apparent signs, to the teachers and parents, would be that they would read well below what is expected of them for their age level. Which, in turn, would cause them to avoid activities that involve reading and spend much longer than their peers on reading tasks. These individuals

would also have spelling difficulties, remembering the sequence of different things, and difficulty seeing or hearing similarities and/or differences in words or letters. With these difficulties, they would also have problems pronouncing unfamiliar words. Finally, after experiencing the apparent signs from school age, the next stage is teens and adults (Dyslexia, 2017).

Now, although, the teens/adult's group is its own, it does share some similar qualities with the previous groups. For instance, they will still experience difficulty reading, have problems spelling, and spend longer on tasks related to reading and spelling, like the school age group. Yet, this group goes deeper into the pragmatics of different situations. What I mean by this is that this group would have trouble with understanding jokes or expressions that are not easily understood, such as "raining cats and dogs" which means it's "pouring outside". They would also have some issues with summarizing stories that they might be telling, face difficulty with memorization, and face difficulty with math problems (Dyslexia, 2017). Now that each groups signs and symptoms have been discussed, it is very important to understand why these two disorders (CAPD and dyslexia) are sometimes confused with one another.

CAPD and dyslexia can sometimes be mistaken for each other in that they are both processing disorders. Each disorder is related to the acquisition of language, despite the fact that the individuals who have these disorders have a normal intelligence. Both types of individuals would have issues in spoken conversation, learning languages, difficulty learning rhymes, and the areas of reading and spelling. As discussed before, these are two completely different disorders. They differ in that one relates to the auditory pathway, while the other relates to the visual pathway. They also differ in that individuals with CAPD would have more attention deficits than those with dyslexia. Another major distinction would be where their

misunderstanding falls in conversations. People with dyslexia would have problems understanding jokes or expressional language that uses words to mean different things than originally intended. Individuals with CAPD would have complications understanding tone and prosody, so how the person is talking and if they are trying to be sarcastic or make a joke (Moncrieff, D, 2013). Throughout this paper, CAPD and dyslexia will be discussed in length from origins, to degrees of severity of each, where deficits lie, and most importantly how to treat and accommodate for each disorder.

After discussing each of these disorders, the next item to discuss is how they were found/ who found them. The main disorder that is being observed in this paper is CAPD, so it is best to start there. CAPD was first discovered or looked into by Helmer Myklebust in 1954. He was a psychologist who lived from 1910 to 2008 and focused on psychoneurological learning disabilities. In 1954, he wrote a book on "Auditory Disorder in Children," which first offered a way to distinguish between different psychic and peripheral deafness, a mental deficiency, and aphasia in childhood. After looking into Auditory Disorders, Myklebust shifted his focus to disorders of reading, where he defined dyslexia as an "inability to read normally due to brain damage" (Duchan, 2011). Unfortunately, he was not the one to first look into dyslexia.

Dyslexia was first explored in the late 1800's. In 1887, a German physician, Rudolph Berlin, coined the term dyslexia to improve the definition of reading problems that was used before. However, the research into dyslexia came a little bit before then. In 1878, a neurologist, Adolph Kussmaul, noticed that many of his patients had problems reading and regularly using words, which led him to introduce the term "word blindness". This led to the word "blindness" to be used interchangeably with those who also experienced difficulty learning to read. Later, when Berlin introduced the term "dyslexia," it was not regularly used. People favored the previous

term “word blindness” until the 1900s (1 The History of Dyslexia). After discussing who founded both of these disorders, the best course of action is to discuss how it potentially impacts individuals in different stages of life.

With CAPD, it is best to start with looking with how it impacts children. Children with CAPD have symptoms consistent with previously listed CAPD signs and symptoms. However, this is the time in a person’s life where CAPD is usually diagnosed. A person will have listening difficulties and may be believed to have attention or hearing difficulties all together. Every child is different, however, which means that each child diagnosed with CAPD will have deficits in different categories or areas that fall under this disorder (Bellis, 2019). In children, and everybody with CAPD, there are seven possible aspects of life that can be affected: Auditory attention, auditory memory, auditory discrimination, figure ground discrimination, auditory synthesis/closure, binaural integration and separation, and temporal processing. Each level builds off the other starting with auditory attention being the most important (Newman, 2017).

To better understand what is actually impacted, it is best to understand what each skill area is. Auditory attention is just the ability to keep focus on an auditory stimulus, for example being able to hear a continuous noise and continue to listen to it. Next would be auditory memory, which is the ability to remember what was heard. Then comes auditory discrimination, which means a person is able to identify the different nuances in words and sounds. After that is figure-ground discrimination. This skill is the ability to hear words or conversation in background noise. Auditory Synthesis/closure is a bit more complicated. This skill is the ability to synthesize the auditory information onto a higher level, otherwise known as the ability to interpret or organize information. Binaural integration and separation are just the ability of a person to either combine or perceive auditory information coming in. Auditory separation allows

for more of a localization of, which makes it possible for people to understand where sound is coming from. Finally, temporal processing is the ability to understand the differences in pitch, duration, and intensity of sounds (Newman, 2017).

Now, you may be wondering how these skill categories actually affect children. When a child has a deficiency in one or more of these categories, never all of them, then it will negatively impact their educational and social lives. Educationally, they will see the deficits if they are unable to retain information from class, as well as focus on what the teacher is trying to tell them. As for socially, they will see an impact in how their peers act towards them. If they are unable to effectively communicate, meaning receptively take in the knowledge from their peers, or be able to focus and maintain a conversation, then their peer interaction would decrease significantly.

After examining the child stage of CAPD, from about seven to twelve years of age, next comes how it impacts teenagers. In the adolescent years, from about twelve to eighteen, the similarities are all too similar to the child years mentioned before. Teenagers will experience more frustration, due to their awareness of this disorder and how it impacts them. They will also experience a lot of miscommunication leading to the loss of friendships and a sense of isolation. Another major impact that CAPD would have during this time is that it would cause individuals to be seen as introverted, when they may actually be an extrovert. AN example would be in conversation. Individuals with CAPD might not catch what was said and would not be able to respond. This would leave an awkward moment and possibly embarrass the individual. Unfortunately, this introversion is just a coping mechanism to handle the deficits that CAPD causes (Mountjoy).

Finally, after the teenage years comes the impact on the adult years. Since CAPD does not affect intelligence, it is worth noting that people who have CAPD and are undiagnosed can come up with strategies to get around or compensate for their deficits. Adults who have CAPD will experience much of the same problems as teenagers and children. They will have deficits in the seven skill areas mentioned before, as well as be perceived as introverts. Adults will also experience issues in their work/career lives. Much like children with education, adults will be seen as poor listeners, but will compensate by learning how to lip read, according to Mountjoy. This would help give them an advantage in the workplace when the environment is too noisy, or they are having issues focusing on the actual auditory information being delivered to them.

Since the impact of CAPD can be seen throughout the lifespan, next comes the impact of dyslexia during life. Like CAPD, we will split dyslexia into three categories: Children/preschool, teenagers/grade school, and adults. As mentioned before in this paper, dyslexia is a disorder that impacts reading, spelling, and writing.

Children with dyslexia will experience deficits in their social, emotional, and educational lives. Similar to those with CAPD, these children will have issues in school. However, they will experience these difficulties when it comes to their ability to read and write, while children with CAPD see their educational problems when information is delivered auditorily. Children will also experience frustration with themselves. They will feel as if they are letting their peers and authority figures down. Along with the social side of its impact, children with dyslexia may experience difficulty reading social cues and may be physically/socially immature (Ryan, M., 2019). These social, emotional, and educational difficulties will then lead to issues in the teenage years.

When the teenage years roll around for a person with dyslexia, they are aware of the possible treatments provided and what to expect from their day to day lives. At this time, they may experience low self-esteem and school avoidance, due to their deficits with reading and writing. Teenagers may also experience anxiety when it comes to education and interactions with peers. These teenagers experience difficulties interacting with others because of their issues with reading and writing. These deficits also translate to the classroom when reading aloud or doing activities that involve reading/proofreading work that needs to be done. Since this is a part of life spent mostly at school, it should also be expected of them to find activities outside of school to help unwind or destress from their everyday lives (Team, U., 2019). After adolescence, individuals with dyslexia next enter adulthood.

When people with dyslexia reach adulthood, they will enter the workforce and experience the issues that come along with it. At this time in life, most people have already realized something is wrong and made compensatory strategies for it or have been diagnosed with dyslexia and been taught different strategies to help. In their careers, they may see issues when writing reports, forms, or different scheduling outlets. Now these adults will usually maximize their strengths, but these deficits greatly impact how they are received in the workplace as well as their ability to apply for promotions and other jobs. Socially, these individuals will be similar to everyone else. They will either overcome and compensate for their deficits in social areas or remain introverted. Emotionally, they will still be frustrated with reading/writing tasks, however, they will have developed ways to overcome and manage the difficulties they have (Adults with Dyslexia, 2019).

Once the stages of life have been explored, the next topic to look into is any at-risk factors. For CAPD, the at-risk factors can be broken down into three categories: Hearing

difficulties, academic characteristics, and behavior characteristics. The hearing difficulties that could make a person at risk are poor listening skills, inappropriate responses, responding too quickly, being easily distracted, and/or hypersensitivity to loud sounds. As for academic concerns, these individuals would have problems with speech and language difficulties, reading, comprehension, spelling, and vocabulary. These individuals will also face issues processing, and their IQ will not match achievement levels. As for difficulties, these individuals may have issues remembering information presented orally, following multi-step directions, and not participating in class discussions. Finally, the behavior characteristics of these individuals make them appear to be more introverted. Their energy is either hypo/hyper active outside of the classroom, yet lethargic when in class. Their attitude also plays an immense role. They seem to not care about class and have issues paying attention; also, they have problems trying new tasks and feel inadequate (Newman, 2017).

As for dyslexia, the risk factors are much simpler to explain. According to the Mayo clinic, there are four main risk factors for dyslexia. Since the disorder can be hereditary, a family history of it or other learning disabilities could lead to an individual obtaining this learning disorder. Another major risk factor is being born premature or low birth weight. An individual can also be influenced in the utero. If the baby is exposed to drugs or infection that alter brain development during this time, then they can develop dyslexia later in life. Lastly, as each person develops they can have individual brain differences in the parts that enable reading (Dyslexia, 2017).

Next to be investigated is the different degrees that these disorders can take place in? However, both disorders discussed in this paper are not thought of as mild or moderate, instead they vary in what they affect. As previously discussed, CAPD potentially affects seven different

skill areas related to auditory processing. How it affects these seven different areas makes it much more difficult to make an actual degree, whether it is mild, moderate or severe. As for dyslexia it can be thought of as different types coming together to form a unique profile. There are five well known categories that it can be sorted out into: Phonological, rapid naming, double deficit, visual, and surface dyslexia (Team, U, Different Types of Dyslexia, 2019).

These five categories are a blend of dyslexic characteristics. People with phonological dyslexia cannot break down sounds and match them with individual letters. Individuals affected by rapid naming dyslexia have issues with processing speed, so they have problems naming numbers and letters when they see them. Double deficit dyslexia is when there is a mix between the first two. Those with this type of dyslexia seem to have issues isolating sounds, while also having trouble naming letters and numbers quickly. Visual dyslexia is more of a range of things. It can often refer to an unusual visual experience, yet it can also be linked to the problems related to surface dyslexia. Lastly, surface dyslexia is when it is difficult for an individual to remember whole words by sight (Team, U, Different Types of Dyslexia, 2019). These different types of dyslexia help to make it easier for people to diagnose and treat the individuals with it.

After discussing the possible degrees, the next important thing to examine is how many people in the population, and who in it, have these disorders. Any person could have either disorder. CAPD affects about twenty percent of school-aged children. However, how many adults it affects is difficult to estimate. The reason for this is because by adulthood they usually have already developed other strategies to compensate for their deficits, making identification more difficult. It is also worth noting that CAPD affects more males than females (Newman, 2017).

The prevalence of dyslexia is estimated to be between five to ten percent of the general population. This means that one in ten people have dyslexia. There is a myth that dyslexia effects men more than women, however, it has been proven that each gender is affected by it equally (Frequently Asked Questions, 2019). In regard to school-aged children, about twenty percent in the U.S. are dyslexic. Another interesting fact about dyslexia is that it tends to run in families, so parents who have dyslexia may also have children with dyslexia (Dyslexia Facts and Statistics, 2019). The next thing to explore is where in the brain the deficits are found in each disorder.

For CAPD, there is no real place in the brain where it can be found. However, since it relates to the auditory system, most causes would relate to the temporal lobe of the brain. As for the actual causes, it could be a few different things. CAPD could be caused by a brain tumor or abscess, a vascular change, some type of brain damage, lead poisoning, or chronic otitis media. The most common cause of CAPD is neuromaturational delay (Newman, 2017). Neuromaturational delay is the term used to describe the developmental disorder that takes place in the brain, meaning that the cause itself is just the development of the brain.

On the other hand, dyslexia can be examined in certain parts of the brain. When looking at where dyslexia can be found, it is best to focus on the left hemisphere first, since that is the hemisphere that processes and handles language. The two main parts to focus on for dyslexia are the left parietotemporal system and the left occipitotemporal area. The left parietotemporal system is involved with word decoding, mapping letters and written words, letter sounds and spoken words, and comprehension of written and spoken language. The left occipitotemporal area seems to be important for fluent reading and rapid, automatic access to words (Hudson, High, & Otaiba, 2019).

Now that both disorders have been discussed in length about what they look like and their potential causes, the next thing to look into is their treatments and accommodations. A major part of identifying what treatments and accommodations are needed is to develop an IEP. An IEP, or Individual Education Plan, is usually presented as a team. During this process, the guardians of the child work with the school to make sure that they are delivering the education that the child deserves. When making an IEP, the goals of it are to identify the individual educational needs of the child, set specific goals and objectives, and determine any other educational essentials they may need (The IEP Process: Everything You Need to Know, 2019).

A major part of the IEP is who diagnoses the individual. These individuals make up the IEP team and help to advocate for what they believe the child needs in and out of the educational setting. For children with CAPD, the people who diagnose them are an audiologist, a speech language pathologist (SLP), the classroom teacher, and the actual guardians of the child. The roles of each differ in which parts they actually observe and treat. The audiologists are the ones who make the definitive diagnoses. They do this by pinpointing the areas affected by the neuromaturational delay and by using behavioral and electro-physiologic techniques. As for the SLP, they will be assessing the impact that the CAPD will have on language and other language dependent items (writing and reading). The SLP will also be providing aural rehabilitation. Aural rehabilitation is basically the process of providing different therapies for clients who have hearing difficulties and then helping them find the correct amplification devices to help them throughout their life. Both the teacher and the guardians of the child act as the people to notice the issue. They refer the child to an audiologist or SLP and then also use the strategies recommended to them to help assist the student in the classroom and at home (Newman, 2017).

As for children with dyslexia, the individuals who diagnose them are usually the parent, teacher, SLP, and an educational psychologist. The educational psychologist and SLP are the ones who perform the tests and collect the family history of the child. They also help to make an effective evaluation plan, which focuses on a remedial program. Finally, these professionals provide the documentation. This allows other professionals to learn about the child's educational history as they move through the school system (Testing and Evaluation, 2019). As for the parent and teacher, they are the ones who will notice any issue first and then implement the treatments and plans that can better assist the child.

When looking at diagnoses, it is important to note the age at which these people should be diagnosed. For individuals with CAPD, the age they will be able to be tested and diagnosed is around seven years old (Newman, 2017). As for individuals with dyslexia, they are diagnosed and seek treatment around kindergarten and first grade. This would make them to be around the age of five or six when diagnosed, which allows them to get early treatment, so that they do not get behind academically (Dyslexia: Diagnosis, 2017).

Before the diagnoses can be made, it is incredibly important to know the criteria the individual must meet to be tested. For children with CAPD, they must be at least seven with normal hearing. They must also have sufficient receptive and expressive language. This will allow them to repeat and understand tasks asked of them by the audiologist. These children must also have normal or near normal intelligence, speak English, and not have attention deficit skills. The reason behind this is because they must be able to understand directions, since the tests are standardized in English, and if they have attention problems, they will not be able to attend to the tasks the tests have them do (Newman, 2017).

Children with dyslexia have less rigorous requirements. These children can be referred for evaluation when either the teacher or parent notice the child struggling with reading. What is important here is the early intervention. The tests used to make a diagnosis are also used throughout the school system to help identify the “at-risk” children. This allows those who have been missed to also get the help they may need (Testing and Evaluation, 2019).

Part of an IEP is an LRE (Least Restrictive Environment). What is an LRE? It is the place where an individual can best learn. This type of environment is used for school-aged children and is a term best used to describe where they will be placed in the school system, whether it be a normal classroom, a specialized classroom, or even a room to themselves.

For a child with CAPD, the LRE depends on what accommodations they may need. Usually, all of these students will be placed in a regular classroom setting. However, they will be provided more help than is usually normal for any one classroom (Newman, 2017). As for children with dyslexia, their LRE is also in a normal classroom setting. For both of these disorders, the idea is to be inclusive and to try and integrate them into as normal a setting as is possible (Power-deFur, L. A., Orelove, F. P., 1997). By working the accommodations into the classroom setting, it better allows the students to socially interact and not feel as different from the rest of the general population.

Now that the LRE has been discussed, the next topic is what accommodations could be used in different environments. The two places that will be discussed are the home and the classroom environment. These two particular environments differ in how the individual with CAPD or dyslexia behaves in them as well as how any adult would interact with the individual. Accommodations can be split into two groups: Techniques to be used by both teachers and parents and technology.

First, we need to look at the accommodations that are used in education settings. For children with CAPD, it is important to think of the acoustical accommodations that can be made. It is imperative to make sure that the individual can hear, so lessening other noise distractions is incredibly important. This can be done by closing the door so that outside stimuli will not enter the classroom. Another great way to limit acoustic stimuli would be to put felt tips or felt object on the bottom of chairs. This will limit the scraping and noises made by chairs. With the installation of carpets and drop ceilings, distracting stimuli can be reduced even more by absorbing the stimuli. Finally, by giving the student preferential seating and by having classroom amplification, the student will do far better (Newman, 2017).

The classroom amplification that can be used to help students with CAPD would be FM trainers. FM trainers, or Frequency Modulation systems, are wireless devices that help amplify sound to help individuals with difficulties in noise. They work for transmitting the speaker's voice to a receiver in the individual's ear. In fact, research has suggested that individuals with CAPD benefit from a prolonged use of FM systems. FM systems improve speech perception, which is especially good in noise when a lot of different acoustic stimuli is interfering with what they should be listening to (FM Systems on Children With Auditory Processing Disorders, 2016). However, FM systems are not for every person with CAPD. The reason for this is because some individuals with CAPD have problems with hypersensitivity to sound, which would only be enhanced by an FM system (Newman, 2017).

The next accommodation that is provided to individuals with CAPD would be strategies and techniques that the teachers and the individuals themselves can do. Strategies that teachers can utilize mainly involve how they interact with the individual. A teacher can rephrase, use simple sentences, and develop previewing habits. By doing this, they provide the information in

a different way, as well as give the student the information as direct as possibly. The technique of previewing has the teacher announcing and reviewing the content, so it will be repeated and rephrased in different ways. These educators can also use eye contact and a slower and more expressive manner to keep the individual's attention. Additionally, by organizing the individual's schedule, the teacher provides a routine that is less stressful and more predictable. Lastly, techniques teachers can use to help individuals with CAPD intersect with the environmental accommodations. By closing doors, using preferential seating, and reducing background noises, the individuals educational experience can be greatly enhanced (Newman, 2017).

Techniques that students can use involve attitude and organization. No matter what life throws at you, a positive attitude is the best way to maintain it. This makes a positive attitude one of the more important strategies an individual partakes. In an educational setting, organization plays a major role. By being organized, the individual will be less distracted, and will also be able to keep a routine. However, this is not all they can do (Newman, 2017).

When actually looking at the education part of this environment, it is important to look at what else these individuals could do. In the classroom, they could do things, such as asking for clarification. This not only provides an outlet for them to learn, but also for the teacher to rephrase what has been said. These students can also study aloud and repeat instructions to themselves. Both of these strategies allow for the information to be constantly talked through to them. The next strategy to be utilized would be accurate note taking. With this strategy, it would be important to make note of key words and emphasized topics, and not to write everything that is said (Newman, 2017).

When looking at the accommodations that could be made at home for individuals with CAPD, they appear to be extremely similar to those made in an educational environment.

Guardians can do things such as reducing background noise and having the individual make eye contact when speaking/listening. Guardians share another accommodation with teachers. Both individuals also should use simple, expressive sentences while speaking slowly, as well as have the individual with CAPD repeat directions. This will give them time to process what has been said as well as make sure the individual comprehends and remembers what they are being told. The final major accommodations that can be made for the individual at home actually involve what the guardian can do. The guardian needs to build the individual's self-esteem and keep in contact with school officials. By building the individual's self-esteem, the guardian is giving the positivity they need to succeed in life. If the guardian keeps in contact with the school officials, then they are able to monitor the child's progress and make suggestions or reports as needed (Central Auditory Processing Disorder (CAPD), 2017).

Dyslexia accommodations are much like CAPD accommodations in that they both rely heavily on what would give the individual an equal education when compared to those who do not have a disorder. Individuals with dyslexia have accommodations split into different categories, with the first category being presentation (Accommodations for Students with Dyslexia, 2019).

Presentation as an accommodation is all about how the material is taught different material. This category is also split into instruction, visual cues, alternative answer sheets, use of songs/poems, and assessment. Instruction can be verbal, so just explaining the material. It can also take the form of repetition, larger print, audio of text, and fewer items per a page of paper. As for visual cues, these can be simple things like highlighted text or graphics emphasizing a point on the paper. Alternative answer sheets and informational songs and poems are exactly what they sound like. These are just different ways to get the individual to comprehend the

material. Finally, assessment involves the use of technology. This technology would be calculators, speech-to-text and text-to speech software, an electronic dictionary, as well as spelling and grammar check (Accommodations for Students with Dyslexia, 2019). The next accommodation students with dyslexia could receive is labeled response.

When using response as an accommodation, it is all about how the individual is allowed to complete assignments and tasks. This type of accommodation can range from things as simple as allowing the individual to mark in the test book instead of an answer sheet to orally stating the answer. These individuals can use keyboard responses, point to their answer, and even describe and record their responses (Accommodations for Students with Dyslexia, 2019). The next two accommodation groups are setting and timing.

Setting is all about the location in which an individual does the work. This can be changed when the individual is placed in an individual or small group. It can also be altered by reducing the distractions for the individual. Reducing distractions can be done by moving the person to a new desk or even to a new private room. Finally, the setting can be altered by switching up how the furniture is arranged. Examples of this would be groupings of desks for group work or a circle formation to allow for discussion. As for timing as an accommodation, it is all about being flexible. Whether it be allowing for extra time, more breaks, or changing the order of material presentation (Accommodations for Students with Dyslexia, 2019). To end the set, the last two groups of accommodations are organization and study strategies.

Both of these groups involve what the individual must do. As for organization, a person with dyslexia may use timers and planners to keep track of time and assignments. They can also use highlighters and color coding to mark important text and different subject areas. When doing math, they can also use graph paper to keep the problem organized. As for study strategies, the

individual can utilize visualization, retelling of the material, rephrasing the material that was taught, and organizing a study group (Accommodations for Students with Dyslexia, 2019). All of these strategies involve repeating and rephrasing the material to help suit how each individual learns, as well as allowing the melding of different students to create a better overall understanding.

What guardians can do at home to accommodate for individuals with dyslexia is slightly different than the educational accommodations that can be made for them. Guardians of people with dyslexia can do things such as reading aloud to the individual or reading together. By doing this, it gives the individual examples and an understanding of what sounds and words look like. During this time, they can also encourage reading time, just to help them improve on their own. Finally, they can work with the individual on schoolwork. When working with the individual on schoolwork, it also gives the guardian a chance to communicate with school and be an advocate for the individual with the disorder (Dyslexia, 2017).

Throughout this paper, a big question that should be asked is why discuss these two together. The main focus of this paper has been CAPD, but one important idea to remember is that there is always a possibility of comorbidities or confusion between disorders. With either of these possibilities it is imperative to understand that disorders can share characteristics with other disorders. By understanding that, then it can be easier to test and evaluate for CAPD. Disorders that commonly have comorbidity with CAPD are Auditory Attention Deficit (ADD), learning disabilities (LD), cluttering, and traumatic brain injuries (TBI) (Newman, 2017). With ADD being diagnosed around the same time as CAPD and affecting at least eleven percent of American children, the two disorders can have comorbidity or be confused with one another much easier than the others (Holland, K., Riley, E., & Krucik, G. T., 2017).

Besides the fact that the two disorders are diagnosed around the same time, they also share some other characteristics. Both CAPD and ADD also intersect in that individuals with them may have problems with directions, poor self-esteem, and problems academically. However, the two disorders differ on key elements. For example, individuals with CAPD would have difficulty just attending to auditory stimuli, while those who have ADD have a generalized difficulty with attention (Newman, 2017). The root of each disorder seems to be the attending skills, whether it be to auditory or general stimuli. This poor attending leads to the final major point to be made: Why is this paper important?

Why is any distinction between disorders important? Each disorder has its own unique characteristics and poses its own problems in an individual's life. The difference between dyslexia and CAPD appears obvious on paper, especially when given characteristics to place them into a cookie cutter mold.

Yet this is not always true. Life is messier than that. No individual fits every characteristic described in that mold, and such is the case of CAPD, if they do meet each of the characteristics described, then they probably have a comorbidity with another disorder. Why then try to make such a distinction and list all the possible qualities of dyslexia and CAPD? My reasoning is the more a person knows, the more they can teach others. By explaining all the possibilities and who to reach out to if a person is suspected of having one of these disorders, the better their chances are of receiving help. Also, if other professionals seek out this information or find they are working with an individual who exemplifies some of these characteristics, they can then do further research and identify what may be happening to their client. By compiling and displaying these two disorders next to each other, it becomes clearer to draw the lines on how they compare and contrast, making future diagnosis that much easier.

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Appendix

PowerPoint: Auditory Processing Disorders by Greg Newman, MA CCC- A, F-AAA

- Slide 2
    - ***Definition of APD:***
        - **<u>What?</u>**
            - **<u>Difficulty in processing</u> and <u>interpreting</u> auditory stimuli**
        - **Where?**
            - **somewhere beyond the auditory nerve**
            - **in the brainstem or cerebral cortex**
            - **in the absence of peripheral hearing loss**
- Slide 3
    - ***Profile of APD:***
        - **Prevalence:**
            - **12-20% of school-age children have APD**
            - **APD affects both children & adults**
                - Adult incidence is difficult to estimate
                - Affects males more than females (?)
            - **Acquired or maturational delay**
- Slide 4
    - ***Causes of APD:***
        - Brain tumor or abscess (rare)
        - Vascular changes in the brain (rare)

        - Brain damage resulting from trauma (rare)
        - Lead poisoning
        - Chronic otitis media
        - Neuromaturational delay (most common)

- Slide 6
    - ***1. Auditory Attention***
        - **Definition:**
            - Ability to sustain attention/focus to an auditory stimulus over time
        - **Relevance:**
            - We must be able to pay attention to auditory stimuli in order to be able to understand it and interpret it
            - Auditory attention is the basis of all auditory skills
                - Without attention, higher-level skills cannot be developed
                - c) This has great significance for academic and social performance

- Slide 7
    - ***2. Auditory Memory***
        - **Definition:**
            - Ability to recall what was heard
            - Ability to recall a number of units (words, numbers, sentences, instructions)
                - auditory sequential memory:
                    - Immediate or

        - deferred recall
    - **<u>Relevance</u>:**
        - Related to ability to follow directions
- Slide 8
    - ***3. Auditory Discrimination***
        - **<u>Definition</u>:**
            - Ability to identify phonemic differences between sounds or words
        - **<u>Relevance</u>:**
            - Related to following directions, spelling, reading decoding, and writing
- Slide 9
    - ***4. Auditory Figure-Ground***
        - **<u>Definition</u>:**
            - Ability to discriminate words in the presence of background noise
            - In the classroom, it is ability to attend to the teacher's voice when students are talking at the same time
        - **<u>Relevance</u>:**
            - Related to auditory attention and auditory memory/following directions
- Slide 10
    - ***5. Auditory Synthesis***
        - **<u>Definition</u>:**

        - The ability to synthesize auditory information on a higher level of functioning so that we can interpret, infer, organize, and s
    - **<u>Relevance</u>:**
        - Related to comprehension of complicated conversations and directions, abstractions, inferences, conclusions, and critical thinking

- Slide 11
    - ***6. Binaural Separation***
        - **<u>Definition</u>:**
            - The ability to perceive 2 different auditory stimuli coming into each ear
        - **<u>Relevance</u>:**
            - Related to auditory discrimination in noise
            - Problems with binaural separation at the base of the problems of many individuals with apd

- Slide 12
    - ***7. Binaural Integration***
        - **<u>Definition</u>:**
            - The ability to combine 2 different auditory stimuli coming into each ear, so that one can understand the whole message
        - **Relevance:**
            - We must be able to distinguish the 2 different messages, and combine them to fully understand what is being said

- Slide 13
    - ***8. Temporal Processing***
        - **Definition:**
            - The ability to perceive fine differences in pitch, intensity, and duration of sounds
        - **Relevance:**
            - It is related to understanding the intonational patterns of speech
            - Intonational patterns help the individual derive the meaning behind the words: e.g. question, sarcasm
            - Problems with temporal processing lay at the base of many language disorders
- Slide 14
    - ***Hearing Difficulties:***
        - Poor listening skills
        - Inappropriate responses to questions
        - Says “What/huh?” often
        - Sometimes responds too quickly
        - Hypersensitivity to loud sound
        - Easily distracted
- Slide 15
    - ***Academic Characteristics:***
        - **Problems with:**
            - Reading, comprehension, spelling, vocabulary

- Speech & language difficulties
- Needs more time to process information
- Discrepancy between IQ & achievement levels

- **Difficulties:**
  - a) remembering information presented orally
  - b) following directions, particularly multi-step directions
  - c) does not participate in class discussions

- Slide 16
  - ***Behaviour Characteristics:***
    - Problems paying attention
    - Hyper/hypo active:
      - acts out in class or is lethargic
    - Reluctance to try new tasks
    - "Don't care" attitude
    - Feelings of inadequacy, depression
    - Fine and/or gross motor skills uncoordinated
- Slide 17
  - ***APD may be the only diagnosis or it may be co-morbid with:***
    - Auditory Attention Deficit (ADD)
    - Learning disabilities (LD)
    - Cluttering
    - Traumatic brain injury (TBI)
    - Dyslexia

- Slide 18
    - ***APD and ADD share several symptoms:***
        - Difficulty with directions
        - Academic problems
        - Poor self-esteem
    - ***APD and ADD have differences:***
        - ***Child with APD*** has <u>difficulty attending to auditory stimuli</u>
        - ***Child with ADD*** has <u>generalized difficulties with attention</u>, not just auditory attending
        - Child with ADD is typically not able to attend to a long lecture, but can focus on an entire baseball game or draw for hours
            - Does this seem to be an attentional problem?
- Slide 19
    - ***Psychological issues are often associated with APD (because of the academic and social problems associated with APD):***
        - APD children do not consistently interpret auditory information
            - How can this impact academic performance?
                - Their academic performance is often "spotty"
            - How can this impact peer & family relationships?
                - Their peer and family relationships frequently suffer
    - **Typically, these APD children cannot identify the problem**
        - They might feel <u>*academically inadequate*</u>, especially if siblings are more academically successful

        - They might “turn off”, act out, or turn inward
        - If their surface behavior alone is examined, the underlying causes might be missed

- Slide 20
    - ***Several Professions are Involved:***
    - **Audiologist:**
        - **a) <u>Makes the definitive diagnosis</u>**
            - Can pinpoint the area or areas of “lesion” or neuro-maturational delay
            - **<u>Uses</u>** behavioral and electro-physiologic techniques
    - **Speech Language Pathologist:**
        - **a) *<u>Assesses</u>*** <u>the impact of APD on language & language</u>-dependent behaviors (reading, spelling and writing)
        - **b) *<u>AR:</u>*** *<u>Contributes significantly to the overall **intervention**</u>*
- Slide 21
    - **Classroom Teacher:**
        - **a) Provides input to the SLP and audiologist**
            - Typically the first person to notice an issue
            - Typically refers the child to the SLP, who then refers to the audiologist
        - **b) Uses strategies** designated by the audiologist and SLP to assist the student with APD in the classroom
    - **Parent(s) and Child:**

        - **a) Provide input to the SLP & audiologist**
            - Sometimes the parent notices the issue
            - Sometimes the parent seeks out help from the SLP and/or audiologist
        - **b) Use strategies** designated by the audiologist & SLP to assist their child at home

- Slide 22
    - **Response to Intervention (RTI):**
        - **1. CHAPS & SIFTER (Teacher)**
        - **2. Fisher (Parent)**
        - **3. Language Evaluation**
            - **- TAPS (Auditory Memory)**
        - **4. Environmental Modifications**
        - **5. Refer for other testing as deemed appropriate:**
            - - neurological
            - - psychoeducational

- Slide 24
    - **In order for a student to have an APD, s/he must:**
        - **1. <u>Age</u>: Be at least 7 years old**
        - **2. <u>Hearing</u>: normal hearing**
        - **3. <u>Have sufficient expressive speech skills</u>**
            - So audiologist can repeat the words/etc in the APD tests what is said

- **4. <u>Have sufficient receptive language skills</u>**
  - So child can understand and perform the tasks
- **5. <u>First language is English</u>**
  - Tests are standardized for English speakers
- **6. <u>Have normal/near normal intelligence</u>**
  - So child can understand directions
- **7. <u>Have attentional skills to perform the tasks</u>**
  - - If child has ADHD, then the issues must be under control so s/he can attend to the challenging APD tests

- Slide 25
  - **Assessment Procedure at BSU (Ideally):**
    - **Language Processing Evaluation (SLP) + Psycho-neurological eval + Psycho-educational eval**
    - **APD Evaluation (Audiologist)**
      - Case history,
      - Observation surveys/ Checklists
        - CHAPPs,
        - SIFTER,
        - Fisher,
        - LIFE)
      - Hearing evaluation to rule out hearing loss as contributing factor to problems,
      - APD test battery

- Slide 26
    - **What?**
        - Battery of tests to determine how efficiently CANS operates
    - **How?**
        - Overloading or overworking it
    - **Who?**
        - Children as young as 7 years
        - Results compared to age-matched peers
        - Performance profiles yield insights into nature of issues the student is having
- Slide 28
    - **Evidence of APD:**
        - Poor scores on *sets of tests tapping similar auditory skills*
    - **Not APD:**
        - 1) Performance below normal on a single test, with no corroboration from other tests tapping similar AP skills
        - 2) Performance below normal on all tests
            - - Suggests more global issues e.g. ADD, cognitive disorder
            - **Remember:**
                - Behavioral manifestations/issues are not necessarily diagnostic for APD
                - These issues could be as a result of other issues e.g. learning issues, social/psychological issues

- Slide 30
    - **3 Areas must be addressed:**
        - **A. Environmental Accommodations**
            - Minimize noise to improve child's ability to hear & understand auditory information
            - Classroom amplification/FM System
        - **B. Compensatory Strategies**
            - Use contextual, visual and linguistic cues
            - Teach the student self-help skills
        - **C. Direct Intervention (Therapy)**
            - Enhance auditory processing skills, inter-hemispheric transfer of information, language
        - **We must combine all of these areas**
- Slide 32
    - **1. Preferential Classroom Seating**
        - a) Move child away from noisy sound sources
        - b) Close to teacher
    - **2. Close the door or seal the entry door with vinyl or felt sound stripping**
        - **-** to reduce the effects of hallway noise, or
    - **3. Put felt tips or old tennis balls on desk legs and under desk lids**
        - - to cut down on desk noises
    - **4. Install fluorescent lighting fixtures into the ceiling**
        - - to reduce harsh effects on the eyes

- **5. Carpeting** absorbs and muffles distracting sounds
- **6. Install drop ceilings** (if possible to further reduce distracting sounds
- **7. Classroom amplification!!!**

- Slide 33
  - **FM trainers and/or classroom amplification:**
    - Can help students attend better in class
    - Trial fitting is recommended
      - - Why? So child, teachers, parents, SLPs, & audiologist can assess the benefit of the FM
    - Audiologist must be involved in the fitting
      - - Why?

- Slide 34
  - **FM trainers & classroom amplification**
    - FMs can be very beneficial for many students,
      - but they are not for everyone:
    - **Why?**
      - Some APD children have problems with hypersensitivity to sound (recruitment)
      - FMs for them may not be an inappropriate decision

- Slide 40
  - **1) The students with APD performed much better with the use of the FMs** than without the FM)

- **2) Importance of close monitoring** (educational audiologist, or committed SLP/teacher)
- **3) Need additional assistance** i.e. the personal FM did not solve all of the listening issues
- **4) Concern about whether or not the students with APD would learn to rely on FM, and not develop listening skills on own**
  - - This is a worrisome question, and we still do not know the answer

- Slide 42
  - **1) Establish eye contact** with child
  - **2) Use a slow, normal, slightly louder, expressive manner**
  - **3) Preferential classroom seating**, facing away from the windows
  - **4) Use direct, simple sentences** whenever possible.
  - **5) Rephrase sentences** rather than repeat them
  - **6) Organize the child's schedule** and routine to increase predictability and decrease stress
  - **7) Reduce background noise** and other distractions as much as possible
  - **8) Classroom amplification**
  - **9) Work in small groups and one-on-one**
  - **10) Develop the habit of previewing**
    - - announcing content,
    - - stating (presenting content), and
    - - reviewing (summarizing content); new vocabulary
- Slide 43

- **11. To Aid with Comprehension:**
  - a) Use direct, simple sentences whenever possible.
    - - When necessary, rephrase sentences rather than repeat them
  - b) Organize the child's schedule and routine
    - - To increase predictability and decrease stress
  - c) Reduce background noise
    - - and other distractions as much as possible
  - d) Work in small groups and one-on-one

- Slide 45
  - **1) Get organized:**
    - -keep a neat desk and appointment calendar,
    - - wear a watch, and
    - - set your alarm clock extra early
  - **2) Study aloud.**
    - - Listen to your voice as you review the materials. It will help you to recall the information
  - **3) Reduce background noise and other distractions**
  - **4) Ask for clarification** when you do not understand
  - **5) Use natural speechreading cues** to help you understand a message:
    - - Watch the person who is speaking
  - **6) Repeat the directions to yourself over and over** until the task is completed
  - **7) Take accurate notes**.

        - - Use key words emphasized by the speaker to help you identify important information.
        - - Do not write down everything that is said
    - **8) Adopt a positive attitude.**
        - **-** The challenge of APD can be minimal or major, depending upon how it is viewed

- Slide 46
    - ***Skill-building Activities:***
        - Designed to improve a specific auditory skill by providing repeated practice of this skill
    - ***Skill areas include:***
        - Auditory memory
        - Auditory closure
        - Phonemic synthesis / closure
        - Auditory discrimination (Q & N)
        - Binaural separation
        - Binaural integration
        - Temporal processing

- Slide 47
    - **Direct Therapy for Decoding Issues**
    - **If Phonological Awareness Deficits:**
        - **A) Auditory training in quiet and noise:**
            - - Use curriculum based words

- - Method

- **B) Use of personal FM system?**
- **C) Classroom amplification** may also be considered

- Slide 48
  - **Binaural Separation Issues:**
    - **(APPLS Program: Updike)**
    - **Develop listening skills in deficit ear**
      - **Have child listen to a chapter of a book on CD, using ear bud in the weaker ear**.
      - ½ hour daily, listening chart
      - Role of the clinician or parent:
        - Can listen to passage using the other earbud, to insure knowledge of the chapter's content
        - Ask questions pertaining to content of story,
        - Ask questions pertaining to comprehension of content
      - Role of the child:
        - Can then summarize chapter, or
        - Answer questions about the content
      - Do this each therapy session, AND at least 5 times at home
      - Outcome:
        - Builds auditory memory;
        - Builds auditory comprehension
        - Better understanding of parent about child's issues

- Slide 53
    - **Binaural Separation & Integration:**
        - Words presented to deficit ear +
        - Distractor speech words in better ear at 30 dB PL
        - *Student repeats both messages::*
            - *deficit ear + better ear*
        - *Once criterion is met, gradually increase distractor speech words in better ear in 5 dB steps with target words in deficit ear always presented at 50 dB PL*
        - *Student repeats both messages:*
            - *deficit ear + better ear*
        - ***Once criterion is met with target words & distractor words at 50 dB PL (0 dB S/N),***
            - ***Goal is met: Stop***
- Slide 57
    - **A) Pitch pattern recognition training** (Fast ForWord)
    - **B) Prosody training:**
        - Apply the patterns to meta-linguistic overlays when OTHERS are reading, associating the grammatical markers with the patterns
    - **C) Establish carry-over** into the child's own reading & conversational skills
        - **Use intonation** to aid in resolving ambiguous sentences
            - e.g. Traveling to new cities can be exciting, but *visiting relatives* can be a nuisance.

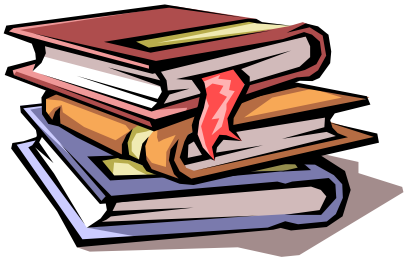
        - **Stress loudness and durational cues to emphasize the more informative parts of a message**
    - **D) Key word extraction**
    - **E) Pragmatics training**
- Slide 58
    - **Direct Therapy for Auditory Memory Issues:**
        - **A) Pre-teach new vocabulary**
            - Use clear, concise, & explicit language
            - Rephrase using simpler language
        - **B) Teach strategies** that aid in retention of complex messages,
            - Examples:
                - (1) Chunking,
                - (2) Verbal rehearsal, and
                - (3) Visualization
        - **C) Memory for pitch patterns**:
            - Example: Simon Says
        - **D) Combine with auditory training in noise:**
            - Add an item each time for recall
            - Start at low levels of background noise, & gradually increase noise level

# Auditory Processing Disorders

By:

Greg Newman, MA CCC-A, F-AAA

Ball State University



# What Is Auditory Processing?

- ***Definition of APD:***
  - **What?**
  - **Where?**
  - **No hearing loss**

# Auditory Processing Disorder

- ***Profile of APD:***

  **Prevalence:**

  - **% of school-age children**

  - **Children & adults**
    - **Adult incidence**
    - **Males vs females (?)**
  - **Acquired or maturational delay?**

# Auditory Processing Disorder

- ***Causes of APD:***

# Skill Areas of Auditory Processing

- ***Auditory processing involves one or more of these auditory processes***
  - Auditory attention
  - Auditory Memory
  - Auditory discrimination
  - Auditory figure ground discrimination
  - Auditory synthesis / closure
  - Binaural separation/integration
  - Temporal processing

# Skill Areas of Auditory Processing

## *1. Auditory Attention*

**Definition:**

- Ability to sustain attention/ focus to an auditory stimulus over time

**Relevance:**

# Skill Areas of Auditory Processing

## *2. Auditory Memory*

**Definition:**

- Ability to recall what was heard
- Number of units (words, numbers, sentences, instructions)
  - auditory sequential memory:

**Relevance**

# Skill Areas of Auditory Processing

## *3. Auditory Discrimination*

**Definition**:

- Ability to identify phonemic differences between sounds or words

**Relevance**:

# Skill Areas of Auditory Processing

## *4. Auditory Figure-Ground*

**Definition**:

- Ability to discriminate words in the presence of background noise

**Relevance**:

# Skill Areas of Auditory Processing

## *5. Auditory Synthesis/ closure*

**Definition**:

- Ability to synthesize auditory information on a high level of functioning

**Relevance**:

# Skill Areas of Auditory Processing

## *6. Binaural Separation*

**Definition**:

- The ability to perceive 2 different auditory stimuli coming into each ear

- **Relevance**:

# Skill Areas of Auditory Processing

## *7. Binaural Integration*

**Definition**:

- Ability to combine 2 different auditory stimuli coming into each ear

- **Relevance:**

# Skill Areas of Auditory Processing

## *8. Temporal Processing*

**Definition**:

- The ability to perceive fine differences in pitch, intensity, and duration of sounds

- **Relevance**:

# “At Risk” Factors Auditory Processing Disorders

***Hearing Difficulties:***

# “At Risk” Factors
# Auditory Processing Disorders

***Academic Characteristics:***

- **Problems with:**

- **Difficulties:**

# “At Risk” Factors Auditory Processing Disorders

***Behaviour Characteristics:***

# Co-existence of APD and Other Disorders

***APD may be the only diagnosis or it may be co-morbid***

# APD and ADD

## *APD and ADD share several symptoms:*

- Directions
- Academics
- Self-esteem

## *APD and ADD have differences:*

- ***Child with APD:*** difficulty attending to auditory stimuli
- ***Child with ADD:*** generalized difficulties with attention
- : typically not able to attend to a long lecture, but can focus on an entire baseball game
  - Does this seem to be an attentional problem?

# Impact of APD on Psychological Issues

***Psychological issues are often associated with APD (because of the academic and social problems associated with APD):***

- APD children & auditory information
  - How can this impact academic performance?
  - How can this impact peer & family relationships?

- Typically, these APD children cannot identify the problem

# Who Diagnoses APD?

***Several Professions are Involved:***

- **Audiologist:**
  - **Role:**

- **Speech Language Pathologist:**
  - **Role:**

# Who Diagnoses APD?

- **Classroom Teacher:**
  - **Role:**

- **Parent(s) and Child:**
  - **Role:**

# What the SLP Should do before Referring the Student for an Auditory Processing Evaluation?

- **Response to Intervention (RTI):**

1. CHAPS & SIFTER (Teacher)
2. Fisher (Parent)
3. Language Evaluation
4. Environmental Modifications
5. Refer for other testing as deemed appropriate:

# Auditory Processing Evaluation

# Requirements for AP Testing

- **In order for a student to have an APD, s/he must:**

1. **Age:**
2. **Hearing:**
3. **Sufficient expressive speech skills**
4. **Sufficient receptive language skills**
5. **First language is English**
6. **Have normal/near normal intelligence**
7. **Have attentional skills to perform the tasks**

# Audiological APD Screening Procedures at BSU

## Assessment Procedure at BSU:

- **Language Processing Evaluation (SLP) +**
- **APD Evaluation (Audiologist)**
  - Case history,
  - Observation surveys/ Checklists
  - Hearing evaluation
  - APD test battery

# Audiological APD Assessment Procedures

- What?
- How?
- Who?

# Audiological APD Assessment Procedures

- **APD Assessment Battery:**
  - **Includes tests that evaluate each of the auditory processes:**
    - Auditory Attention
    - Auditory Discrimination
    - Auditory Discrimination in Noise
    - Auditory Synthesis/ Closure
    - Binaural Integration
    - Binaural Separation
    - Temporal Processing
      - Pitch, intensity, duration

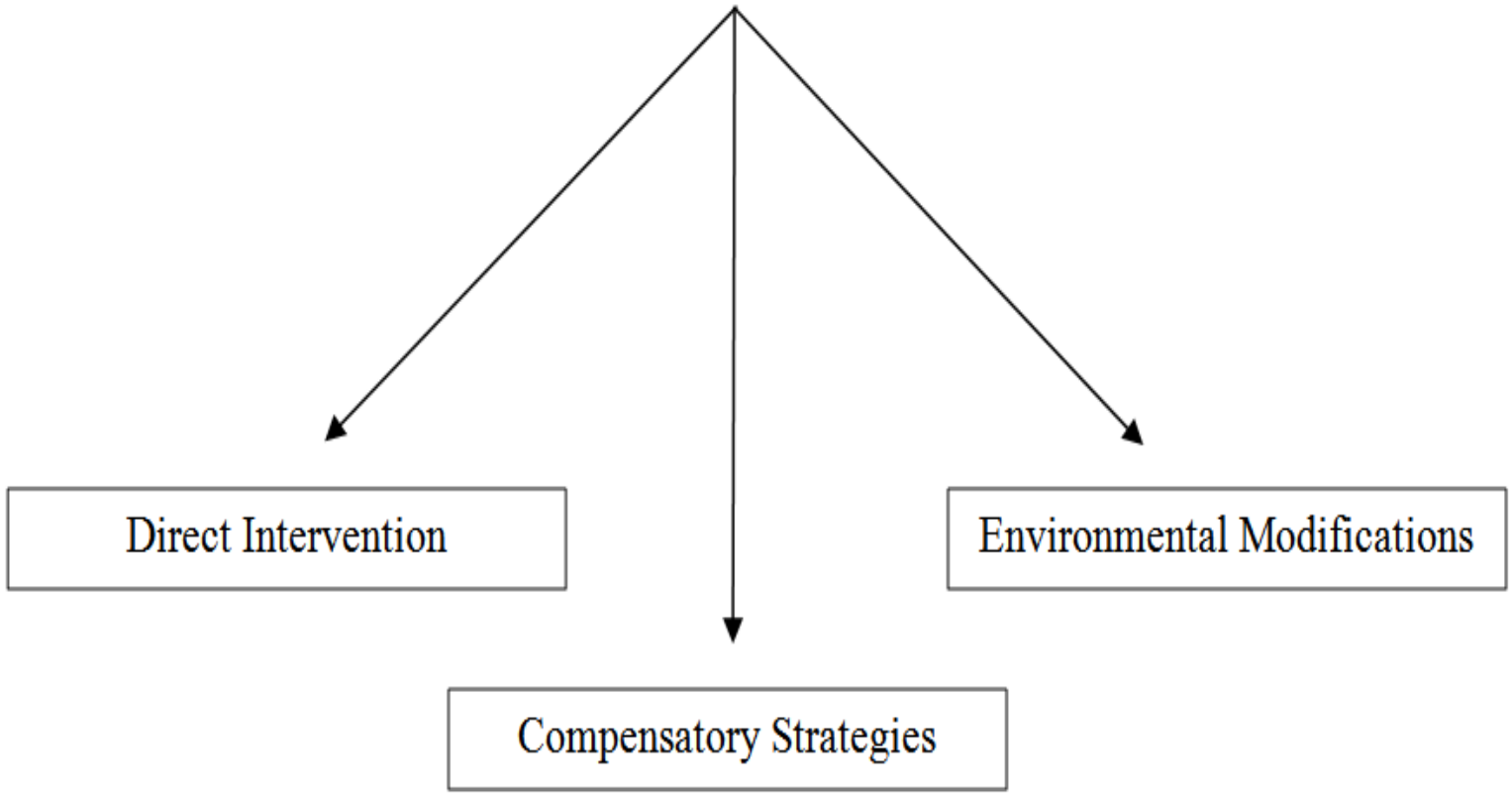
# AP Test Interpretation

- **Evidence of APD:**

- **Not APD:**
  - 1) Performance below normal on a single test
  - 2) Performance below normal on all tests
    - Suggests
    - **Remember:**

# When a Student is Diagnosed with APD: What comes Next?

**3 Areas must be assessed:**



# Remediation for APD

## 3 Areas must be addressed:

- A. Environmental Accommodations
- B. Compensatory Strategies
- C. Direct Intervention (Therapy)

**We must combine all of these areas**

# A. Environmental Acoustical Accommodations

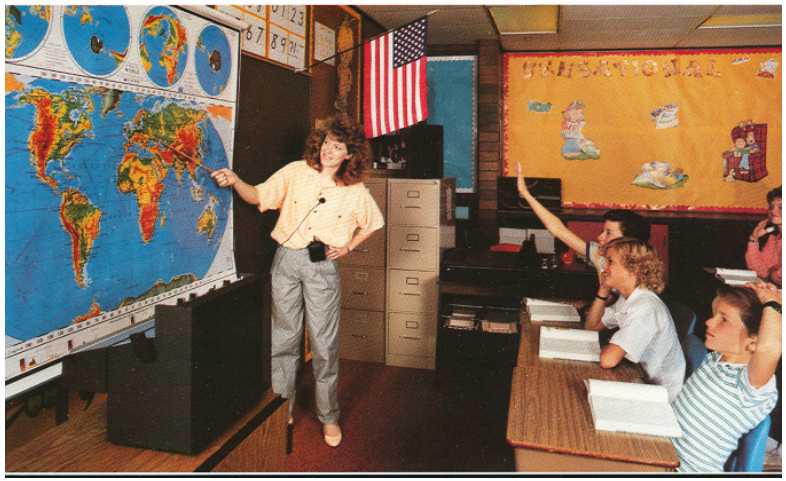
**Suggestions: Let's think**

# A. Environmental Acoustical Accommodations

1. Preferential Classroom Seating
2. Close the door
3. Felt tips or old tennis balls
4. Lighting fixtures into the ceiling
5. Carpeting?
6. Drop ceilings
7. Classroom amplification!!!

# A. Environmental Acoustical Accommodations: Classroom Amplification

- **FM trainers and/or classroom amplification:**
  - Trial fitting
    - Why?
  - Importance of Audiologist being involved in the fitting



# A. Classroom Acoustical Accommodations: Amplification

*(continued)*

- **FM trainers & classroom amplification**
  - **Beneficial, but not for everyone**
  - **Why not?**

# Personal FM Systems and Students with APD

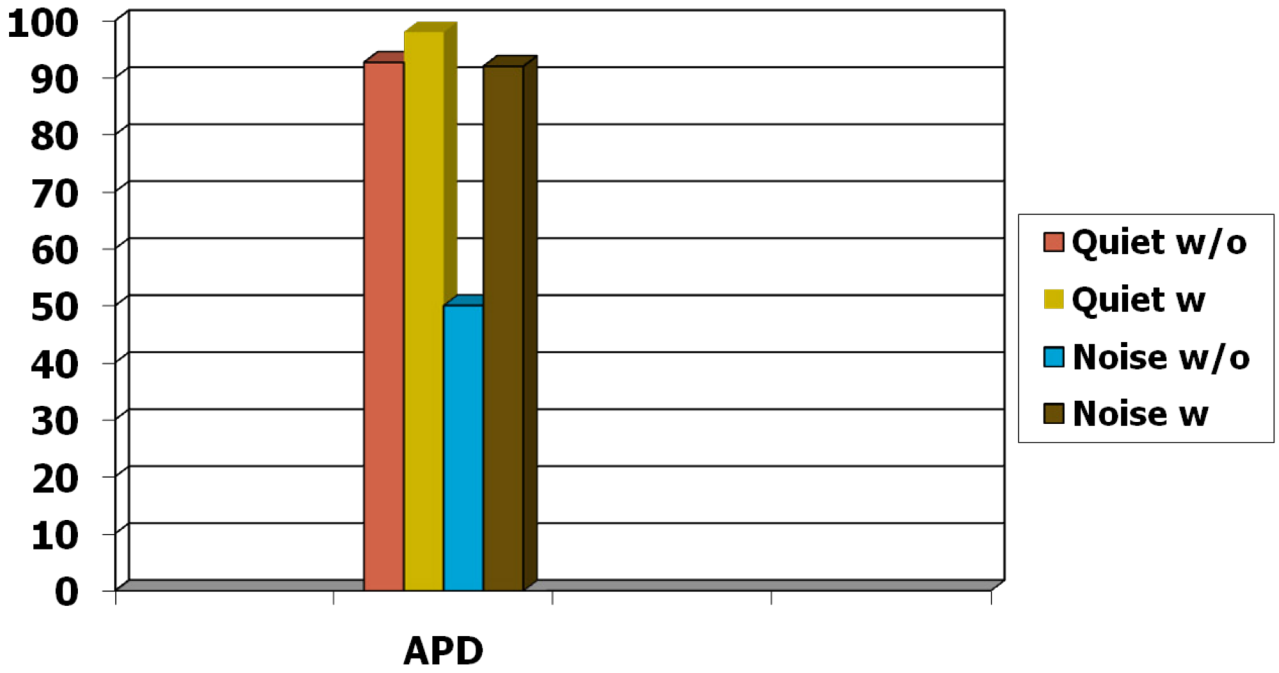
## Do FM Systems Help Some Students with APD?

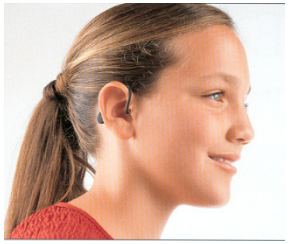
# Personal FM Systems and Students with APD

## Updike Research:

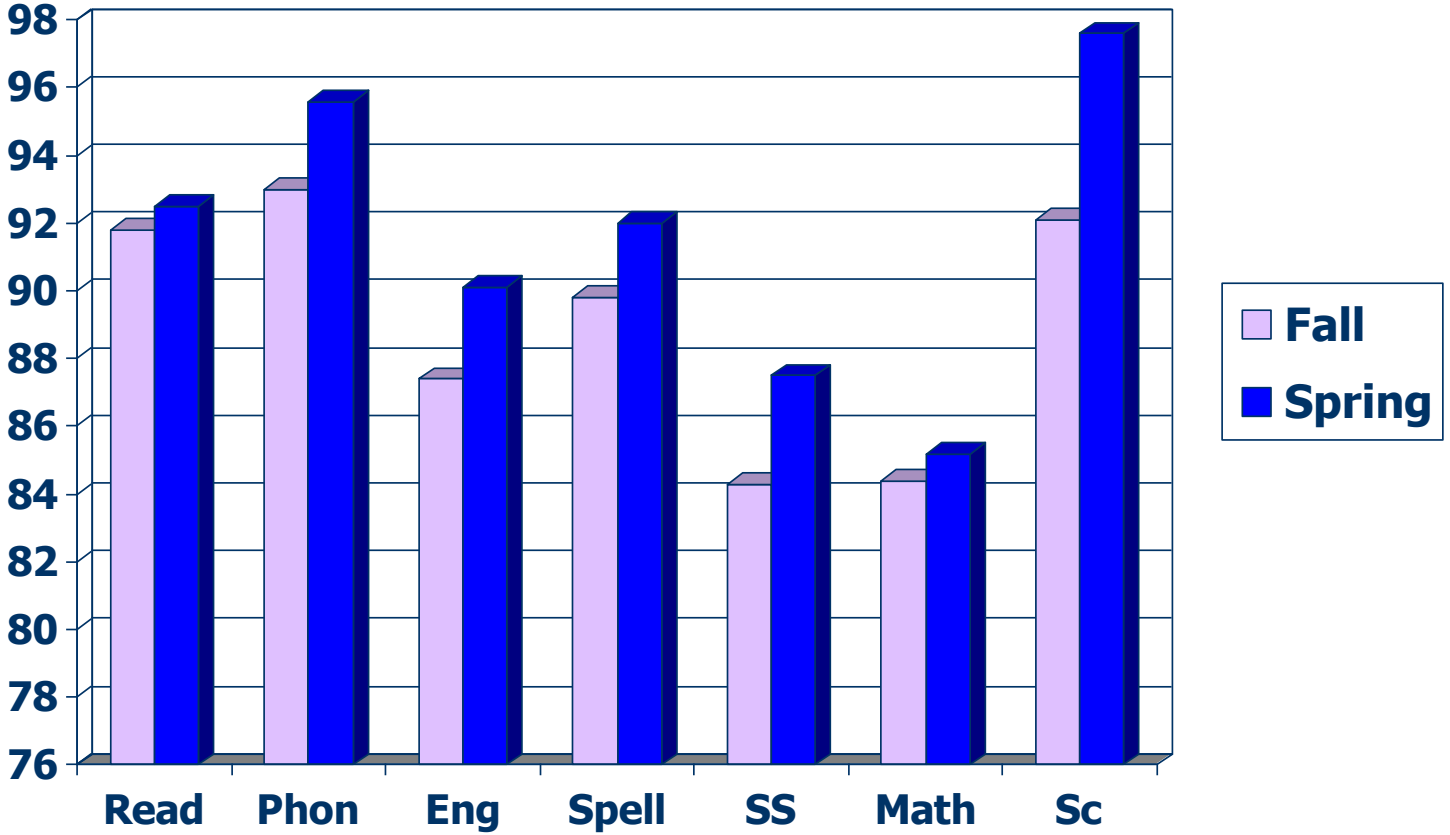
- 2 groups of students, 7-9 years old
- Group 1: APD (Aud Closure, Fig-Grd, Bin Sep, LE Deficit)
- Group 2: Control (no issues, no ADD)

# Word Discrimination Scores for Students with APD Without & With EduLink System

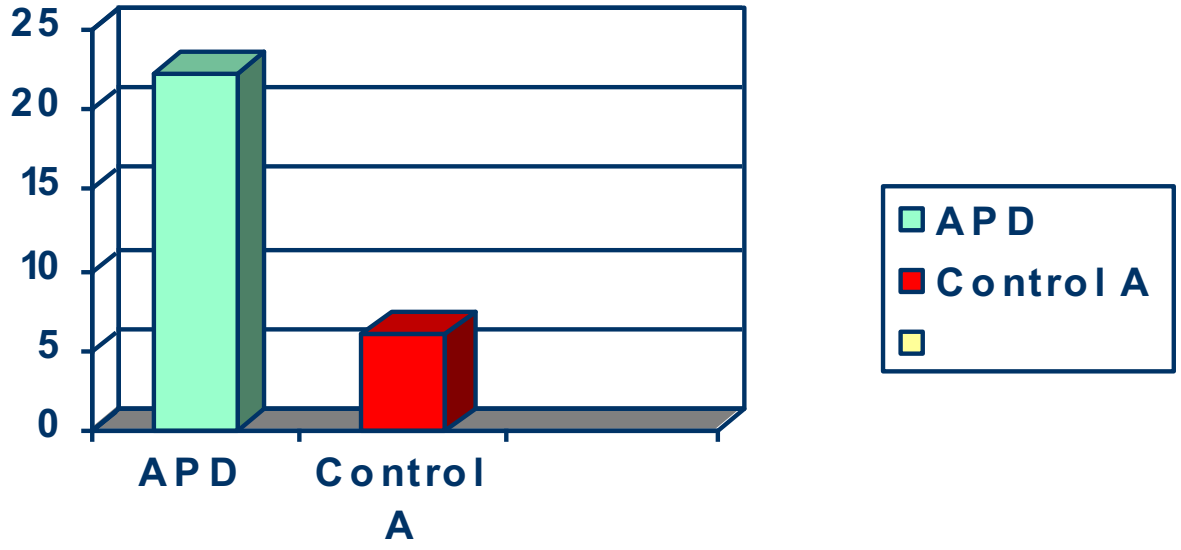


# Academic Scores for Students with APD Without & With EduLink System



# Teacher Evaluation of FM Systems with Students with APD



# Summary of Dr. Updike's Results/Conclusions

1) Performance of the students with APD

1) Importance of close monitoring

2) Need for additional assistance

3) Concern about whether or not the students with APD would learn to rely on FM, and not develop listening skills on own

# B. Strategies for Teachers

1) Let's think of some!

# B. Strategies for Teachers

1) Eye contact
2) Manner
1) Classroom seating,
4) Sentences
5) Rephrase
6) Organize
7) Background noise
8) Classroom amplification
9) Small groups and one-on-one
10) Preview

# B. Strategies for Teachers

## 11.To Aid with Comprehension:

# B. Strategies for Students

## Let's think of some!

# B. Strategies for Students

1) Organization:
2) Study aloud.
3) Background noise and other distractions
4) Clarification
5) Speechreading cues
6) Repeat
7) Take notes.
8) Adopt a positive attitude.

# C. Direct Therapy (Treatment)

***Skill-building Activities:***

- Designed to improve a specific auditory skill by providing repeated practice of this skill

***Skill areas include:***

- Auditory memory
- Auditory closure / synthesis
- Auditory discrimination (Q & N)
- Binaural separation
- Binaural integration
- Temporal processing

# C. Direct Therapy (Treatment)

*(continued)*

## Direct Therapy for Decoding Issues

- **If Phonological Awareness Deficits:**

  **A) Auditory training in quiet and noise:**

  **B) Use of personal FM system?**

  **C) Classroom amplification**?

# C. Direct Therapy (Treatment)
## APPLS Program: Updike

**Develop Listening Skills in Deficit Ear / Auditory/ Reading Comprehension:**

- **Have child listen to a chapter of a book on CD, using ear bud in the weaker ear**.
- ½ hour daily, listening chart
- Role of the clinician or parent
- Role of child
- Do this each therapy session, AND at least 5 times at home
- Outcome?

- **See APPLS Handout**

# C. Direct Therapy (Treatment)

## APPLS Program: Updike *(continued)*

## Auditory Discrimination Skills:

- Present words in deficit ear @ 50 dB (conversational level)
- *Student repeats words*
- Once criterion is met, gradually lower presentation level in 5 dB steps and present words
- *Student repeats words*
- Decrease presentation level (PL) until criterion is met at 30 dB:
- Goal is met: Stop

# C. Direct Therapy (Treatment)

## APPLS Program *(continued)*

### Auditory Figure Ground Skills:

- Present words in deficit ear at 50 dB PL
- Distractor noise in same ear at 30 dB PL.
- *Student repeats words*
- Once criterion is met,:
  - Present words at 50 dB
  - Gradually increase distractor noise in 5 dB steps
  - *Student repeats words*
- **Once criterion is met with words in deficit ear at 50 dB, & noise in same ear at 50 dB**
  - **Goal has been met:**

# C. Direct Therapy (Treatment)

## APPLS Program *(continued)*

### Binaural Separation:

- **Part A**
  - Words presented to deficit ear .+
  - Distractor noise in better ear.at 30 dB PL
  - *Student repeats words in*
    - *deficit ear only*
  - Once criterion is met, gradually increase presentation level of distractor words in 5 dB steps +
  - Present target words in deficit ear at 50 dB
  - *Student repeats words in*
    - *deficit ear only*
  - ***Once criterion is met with target words and distractor words at 50 dB PL (0 dB S/N), then goal is met: Stop***

# C. Direct Therapy (Treatment)

## APPLS Program *(cont')*

- **Binaural Separation:**
- **Part B**
  - Words presented to deficit ear +
  - Distractor words in better ear at 30 dB PL
  - *Student repeats words in*
    - *deficit ear only*
  - Once criterion is met, gradually increase presentation level of distractor words in 5 dB steps +
  - Present target words in deficit ear at 50 dB
  - *Student repeats words in*

    *deficit ear only*
  - ***Once criterion is met with target words & distractor words at 50 dB PL (0 dB S/N),***
    - ***Goal is met: Stop***

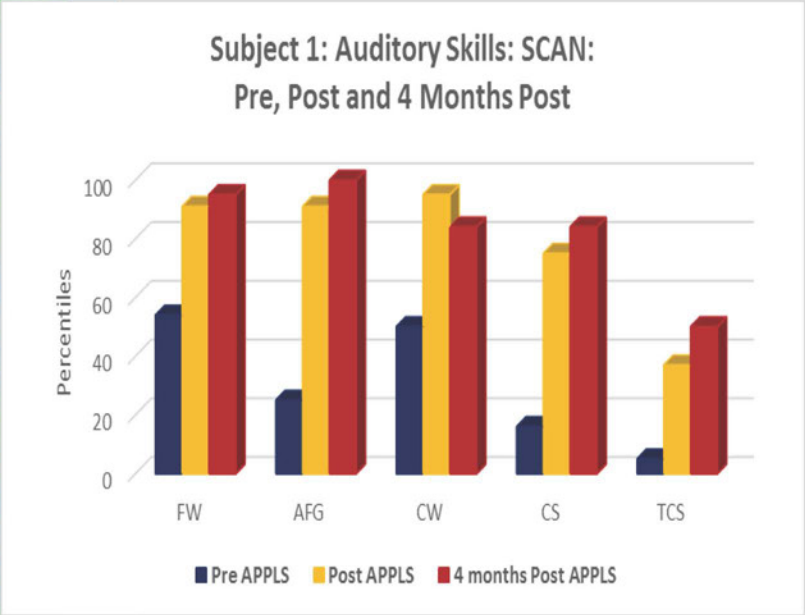
# C. Direct Therapy (Treatment)
## APPLS Program

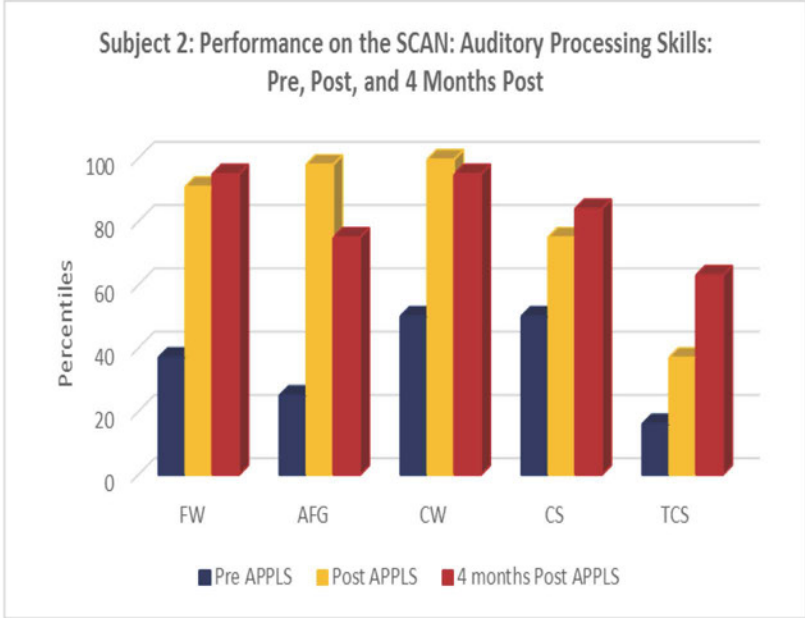
## Binaural Separation & Integration:

- Words in deficit ear +
- Distractor speech words in better ear at 30 dB PL
- *Student repeats both messages::*
- *deficit ear + better ear*
- *Once criterion is met, gradually increase distractor speech words in better ear in 5 dB steps with target words in deficit ear always presented at 50 dB PL*
- *Student repeats both messages:*
- *deficit ear + better ear*
- ***Once criterion is met with target words & distractor words at 50 dB PL (0 dB S/N),***
  - ***Goal is met: Stop***

# C. Direct Therapy (Treatment)

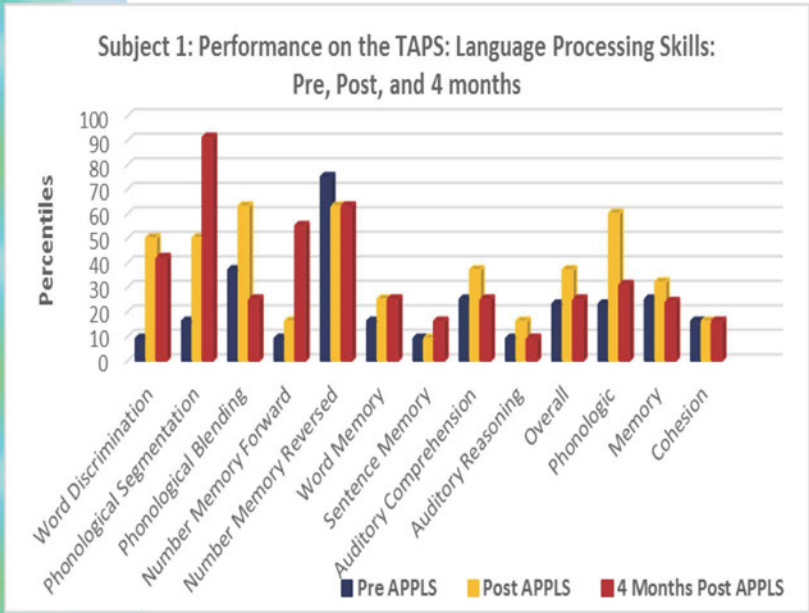
## APPLS Program

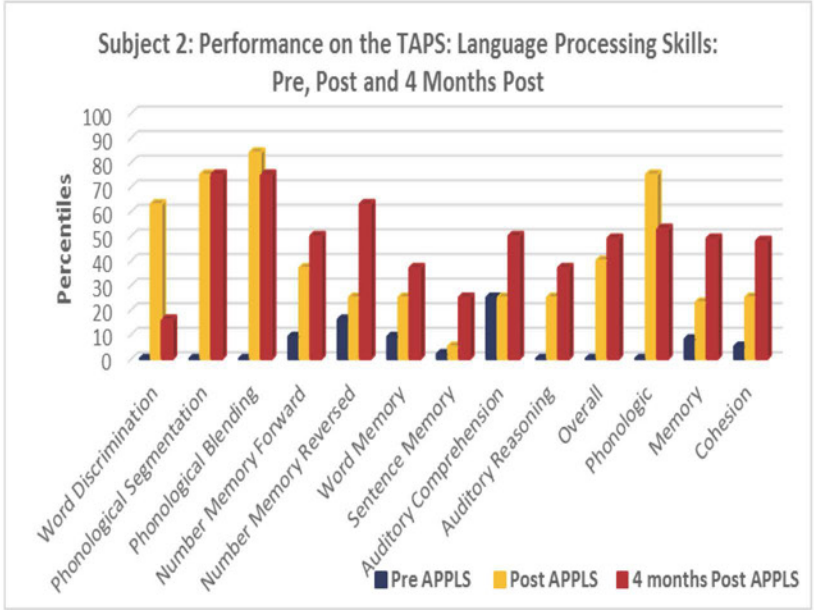


# C. Direct Therapy (Treatment)

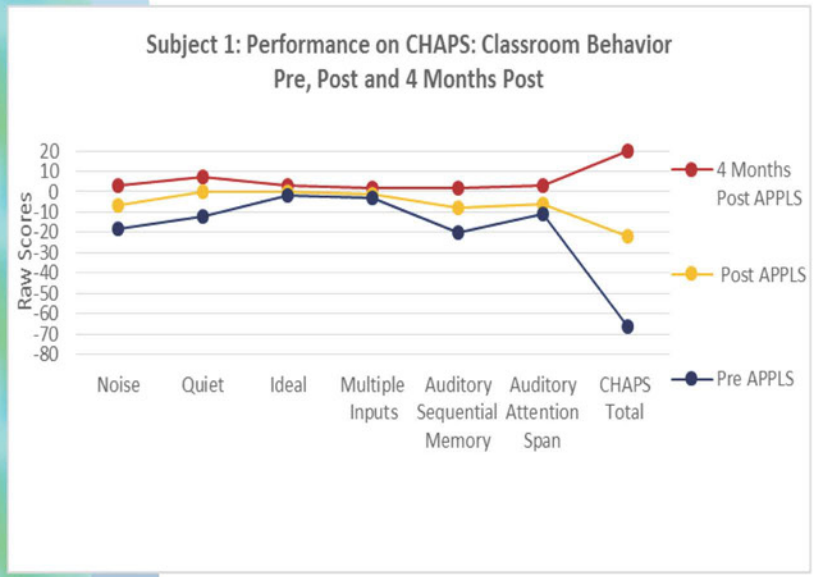
## APPLS Program

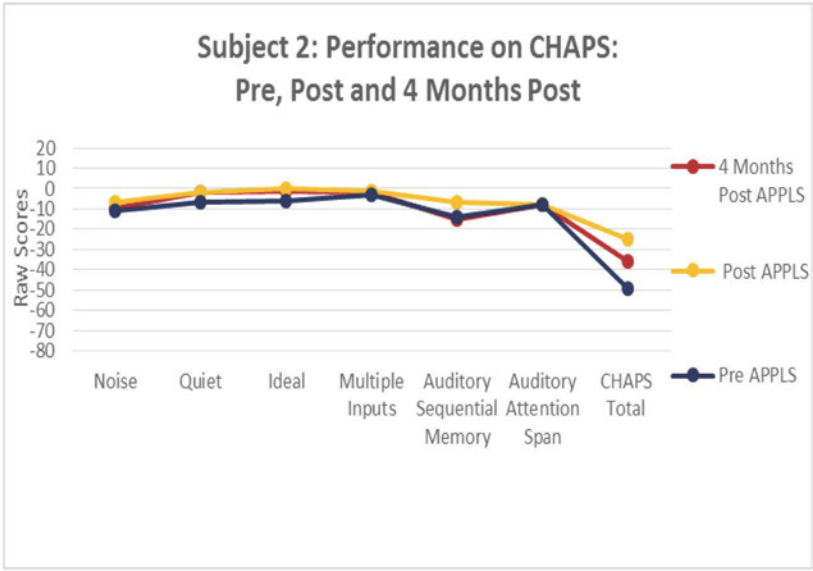


# C. Direct Therapy (Treatment)

## APPLS Program



# C. Direct Therapy (Treatment)

- **Direct Therapy for Prosody Issues:**

**A) Pitch pattern recognition training**

**B) Prosody training:**

  - Apply the patterns to meta-linguistic overlays when OTHERS are reading,

**C) Establish carry-over** into the child's own reading & conversational skills

  - **Use intonation**
  - **Stress loudness and durational cues**

**D) Key word extraction**

**E) Pragmatics training**

# C. Direct Therapy (Treatment)

*(continued)*

## Direct Therapy for Auditory Memory Issues:

**A) Pre-teach new vocabulary**

**B) Teach strategies** to retain of complex messages,

- examples

**C) Memory for pitch patterns**:

- example

**D) Combine with auditory training in noise:**

- Add item s
- Gradually increase noise level

# C. Direct Therapy (Treatment)

*(continued)*

- **Commercial Programs:**
  1) Earobics
  2) FastForward
  3) DIID (Dichotic Interaural Intensity Difference)
     - not available
  4) APPLS (Auditory Processing & Perception of Language Skills): No charge

– To just mention a few!